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# THE UNITED STATES OF AMERICA

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APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A  
FILING DATE UNDER 35 USC 111.**

**APPLICATION NUMBER: 60/514,004**

**FILING DATE: October 27, 2003**

**By Authority of the  
COMMISSIONER OF PATENTS AND TRADEMARKS**



*M. Sias*

**M. SIAS  
Certifying Officer**

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**PROVISIONAL APPLICATION FOR PATENT COVER SHEET**

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No.

22141 U.S. PTO  
60/514004



INVENTOR(S)					
Given Name (first and middle [if any])		Family Name or Surname		Residence (City and either State or Foreign Country)	
MARCELLIN		BRUNEAU		Rouyn-Noranda, (Québec) CANADA	
Additional inventors are being named on the _____ separately numbered sheets attached hereto					
TITLE OF THE INVENTION (500 characters max)					
UNIVERSAL GROUND ANCHOR SUPPORT FOR MINE SHAFT					
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<input checked="" type="checkbox"/> Customer Number: <span style="border: 1px solid black; padding: 2px 20px;">23863</span>					
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<input type="checkbox"/> CD(s), Number _____					
<input checked="" type="checkbox"/> Drawing(s) Number of Sheets <u>6</u>					
<input checked="" type="checkbox"/> Other (specify) <u>PTO-FB-235 (8-83)</u>					
<input type="checkbox"/> Application Date Sheet. See 37 CFR 1.76					
METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT					
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27.					
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<input checked="" type="checkbox"/> The Director is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: <u>12:1110</u>					
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<input checked="" type="checkbox"/> No.					
<input type="checkbox"/> Yes, the name of the U.S. Government agency and the Government contract number are: _____					

Respectfully submitted,

[Page 1 of 2]

Date October 23, 2003

SIGNATURE

REGISTRATION NO. 33072

TYPED or PRINTED NAME François MARTINEAU

(if appropriate)

Docket Number: 2988-2

TELEPHONE 514-861-4831

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This collection of information is required by 37 CFR 1.51. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop Provisional Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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**TITLE : UNIVERSAL GROUND ANCHOR SUPPORT FOR MINE SHAFT**

This invention relates to the rock bolting industry, for reinforcing side walls – including ceilings - from recently made mine shafts, tunnels, or the like underground structures. Ground reinforcing and supporting means such as anchoring bolts,  
5 are conventionally used throughout the world, to support engineering structures such as tunnels, mines, retaining walls, water dams, and piers.

Conventional rock bolting unit anchors may include a bolt with expander  
10 plug leaves at one end portion, these leaves having an outer surface which is roughened by serrations. This roughening increases the friction between the anchor and the surface of the borehole in which the anchor is inserted. The inner surface of the leaves have a taper which matches the taper on the corresponding surface of the expander plug. On installation, the bolt or stud is torqued, which then draws the expander plug  
15 down into the anchor. The leaves expand in a radial outward direction and securely engage the surface of the borehole, which anchor then becomes locked.

Examples of various types of conventional rock bolting ground supports include threaded rock studs (with or without headed rock bolts), and mechanical  
20 anchors (with expansion shells). In the industry, there are in particular five types of rock bolting units that are available : the rockbolt, the "Rebar", the split-set, the Swoelex and the cable-bolt. The rockbolt is probably the most ancient, which uses a

simple shaft with a shell, so as to maintain the rock wall in place. The rockbolt type of support has important drawbacks, in particular in that it is maintained in contact with the rock wall solely at its outer end portion, and its resistance varies with the type of ground material to be solidified.

5

The Rebar type of ground support consists of a shaft with a spiralling external wall. The Rebar support may be for example threaded, with a forged head or made from fiberglass. After a borehole has been made in the rock wall, warm resin sticks need to be installed before the rebar support is rotatively engaged forcibly. Once the resin cures, the rebar shaft becomes integral with the rock wall portion surrounding the borehole. Installation time is therefore high, and impractical in very cold subfreezing weather due to the need to keep the resin warm before and during insertion inside the rock borehole.

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15

The split-set type of support consists of a tube which is diametrically slightly larger than the borehole, and which includes a lengthwise slit. As this tube is engaged into the borehole, the tube is interiorly compressed, thus supporting the adjacent rock formation. However, split-set supports have many drawback, including :

20

- they are rarely able to extend the full length of the borehole;
- they easily rust;
- they require a lot of clearance at the inner end of the borehole.

The swoelex type of support consists of a curved shaft which is lengthwisely interiorly inclined. Such support required a high output air pump, to inflate the shaft until it becomes complementary in shape to the borehole inner surface. Such support is very expensive, can rust, and is very expensive in labour costs and capital outlay.

The cable bolt type of support requires a borehole of a length between 12 and 200 feet. Steel balls are anchored at each 10 or 20 feet segments of the cable. An air pump and cement are required. It is very expensive in labour costs and capital costs.

10

There is therefore a need for a ground anchor support for mine shaft rock walls and the like, which will be adaptable for operational performance in a wide variety of contexts.

15 In the annexed drawings :

Figures 1 and 2 are sectional elevational views of an upright side wall from a mine shaft, each showing an anchor bolt having an inner end portion, inside the mine shaft wall rock and fitted with an expansion shell according to the prior art, and an outer end portion, projecting outwardly from the side wall rock;

20 Figures 3 and 4 are views similar to figures 1 and 2 respectively, but with the anchor bolt being fitted with a rock anchor support shown in lengthwise sectional view, according to the present invention;

Figure 5 is a longitudinal sectional view of a first embodiment of anchor support from figures 3 and 4;

Figure 6 is a cross-sectional view of the anchor support of figure 5;

Figures 7 and 8 are views similar to figures 5 and 6 respectively, but for a second  
5 embodiment of anchor support of the invention;

Figures 9 and 10 are views similar to figures 5 and 6 respectively, but for a third embodiment of anchor support of the invention;

Figures 11 and 12 are views similar to figures 5 and 6 respectively, but for a fourth embodiment of anchor support of the invention;

10 Figures 13 and 14 are views similar to figure 3, but showing two alternate embodiments of bolt and anchor support assemblies according to the invention;

Figure 15 is an enlarged plan view of the friction flair lock ring forming part of the anchor support of the invention;

Figures 16 and 17 are side edge views of the lock ring of figure 15, sequentially  
15 showing how the friction flairs can tilt under radial load and the lock ring becomes integral to the adjacent rock material in the rock cavity engaged by the anchor bolt; and  
Figure 18 is a view similar to figure 3, but at a smaller scale and showing still another alternate embodiment of bolt and anchor support assembly according to the invention.

20 Figures 1 and 2 show a prior art type of rock bolting unit 20, for engagement into a borehole B made into the rocky material R of an upright side wall W from a mineshaft. Rock bolting unit 20 includes a cylindroid shaft 22, with an outer

threaded free end portion 24 for threaded engagement by a nut 26. Nut 26 is adapted to engage against the rocky wall surface W, with a bearing plate 29 preferably sandwiched therebetween. The inner portion of shaft 22 includes an inverted wedge piece 28 freely partly engaged axially by a standard serrated expansion shell 30. The inner end of expansion shell 30 includes radially outwardly and endwisely inclined friction flairs 32. Shell 30 is slidable along wedge piece 28 to progressively move radially outwardly to become anchored to the inner surface of borehole B. Flairs 32 prevent shell 30 from receding outwardly toward the borehole mouth Ba.

In accordance with the teachings of the invention, there is shown in figures 3-4 a rock bolting unit 20' including a shaft 22' with threaded outer end portion 24' and associated nut 26' and bearing plate 29'. The inner end portion of shaft 22' carries an annular sleeve 40 made from an elastomeric material, for example rubber or a resilient polymeric material. Sleeve 40 is diametrally larger than shaft 22', and is anchored thereto at the inner end thereof by a welded anchor plate 42. A second anchor plate 44 is slidably mounted to an intermediate section of shaft 22', and adapted to be mounted to the inner end of sleeve 40 by a locking ring 46. Radially outwardly inclined friction flairs 48 are carried by plate 44, to prevent accidental egress motion of sleeve 40 once inside the borehole B. In operation, once end anchor plate 42 abuts against the inner end of the borehole wall B, by screwing nut 26' along threaded end portion 24' of shaft 22', the first anchor plate 42 compresses the sleeve 40 to deform radially outwardly, thus eventually coming to frictionally lockingly engage with the

side wall of the borehole B. Figure 4 shows the sleeve 40 being radially outwardly displaced at 40' after deformation following nut screwing of nut 26'.

Figures 5 and 6 show such a cylindroid elastomeric sleeve 40.

Figures 7 and 8 show an alternate cylindroid sleeve member 140, including a  
5 radially inner elastomeric tube 142 and a radially outward slitted metallic sleeve 144.

Figures 9 and 10 show an alternate cylindroid sleeve member 240, including a pair of relatively inverted interengaged wedge units 242 and 244. Radially outward wedge unit 242 is made from elastomeric material, for example a compressible material such as rubber or a soft polymer; whereas radially inward wedge unit 244 is made  
10 from a rigid material, for example stainless steel, having a smooth outer surface for minimal frictional interaction with radially outward wedge unit 242.

Figures 11 and 12 show still another alternate cylindroid sleeve member 340, including :

- a) a rigid radially outward tube 342, made for example of stainless steel, with tube  
15 342 being slitted lengthwisely;
- b) a rigid, non compressible radially inward tube 344, made preferably from a set polymeric material, and with smooth radially outward surface to minimize frictional interaction with the radially outward tube 342; and
- c) a soft elastomeric tube 346, mounted radially intermediate the tubes 342 and 344.

20 Figure 13 shows an alternate rock bolting unit 400. Unit 400 includes a shaft 402 with a main portion 403 covered by a full length elastomeric sleeve 404 therealong. To the threaded inner end portion 406 of shaft 402 is threaded a nut 408, which is



destined to frictionally interlock with the rocky wall W via a bearing plate 410. Washers 412 and 414 are provided at the opposite ends of the shaft main portion 403. A standard expansion shell assembly 415 is axially mounted to the inner washer 412, while the outer washer 414 abuts against the rocky wall bearing plate 410. Friction  
5 flairs 416 project in radially outwardly inclined fashion from inner washer 412. Such an embodiment is particularly suitable to replace the rock bolting units of the rebar, rock-set or swellex types.

Figure 14 discloses still another alternate rock bolting unit 500. Unit 500 includes a shaft 502 with a main portion 503 covered by a full length elastomeric sleeve  
10 504 therealong. To the threaded inner end portion 506 of shaft 502 is threaded a nut 508, which is destined to frictionally interlock with the rocky wall W via a bearing plate 510. Anti-egress lock rings 512 and 514 are provided both at the same inner end portion of the shaft main portion 503. An end plate 516 closes the inner end 502A of shaft 502, and is engaged by inner end lock ring 512. The outer end of elastomeric  
15 sleeve 504 abuts directly against the bearing plate 510. Such an embodiment is also suitable to replace the rock bolting units of the rebar, rock-set or swellex types.

Figures 15-17 show the friction flair discoid unit such as 48 in figures 3-4. Unit 48 includes a number of radially outwardly inclined bevelled tips 148, for  
20 example eight successively equidistant tips as illustrated. Each tip 148 may form a triangular integral extension from the periphery of discoid unit 48. Unit 48 is cut shaped, as illustrated in figure 16, with triangles 148 extending in a radially outwardly

inclined fashion, so that they may tilt under contacting load from the inner surface of the borehole B to become orthogonal as 148' to the general plane of the unit 48.

Figure 18 discloses an elongated threaded shaft 600 having an inner end portion 600A and an outer end portion 600B. An exposed rock side wall bearing plate 602 is  
5 locked about outer end portion 600B by a pair of screwing nuts 604, 606, meshing on threaded shaft 600 and taking the plate 602 in sandwich therebetween. A first expansion shell member 608 is mounted to the shaft inner end portion 600A, and a second expansion shell member 610 is mounted to a portion of shaft 600 spacedly intermediate the first expansion shell member 608 and the bearing plate 602. An  
10 elastomeric or soft polymeric sleeve 612 is mounted around shaft 600 and taken in contacting sandwich between intermediate expansion shell 610 and bearing plate inner nut 604. By selectively screwing the nuts 604 and 606, the expansion shells 608 and 610 are brought in operative diametrically enlarged rock anchoring condition. In the present invention, as in the other embodiments, the rubber sleeve 612 (or 40, 140, 240,  
15 344, 404 or 504) is compressed under mechanical loads during underground support and retaining load induced stresses.

**I CLAIM:**

A rock bolting unit including a shaft with threaded outer end portion and associated nut and bearing plate, the inner end portion of said shaft carrying an  
5 annular sleeve made from an elastomeric material; said sleeve diametrically larger than said shaft, and anchored thereto at the inner end thereof by a welded anchor plate; a second anchor plate is slidably mounted to an intermediate section of shaft and adapted to be mounted to the inner end of sleeve by a locking ring; radially outwardly inclined friction flairs are carried by the plate to prevent accidental egress motion of sleeve once  
10 inside the borehole ; wherein in operation, once end anchor plate abuts against the inner end of the borehole wall, by screwing nut along threaded end portion of shaft , the first anchor plate compresses the sleeve to deform radially outwardly, thus eventually coming to frictionally lockingly engage with the inner side wall of the borehole .

15

2986-2.t01

**DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION  
DECLARATION POUR DEMANDES DE BREVETS AVEC POUVOIRS**

**FRENCH LANGUAGE DECLARATION  
form PTO-FB-235(8-83)**

En tant qu'inventeur nommé ci-après, je déclare par les présentes que mon nom, mon domicile, mon adresse postale et ma nationalité sont ceux qui figurent ci-après. Je déclare que je crois être l'inventeur original, premier et unique (si un seul nom figure sur le présent acte) ou un des co-inventeurs, originaux et premiers (si plusieurs noms figurent sur le présent acte) du sujet revendiqué et pour lequel un brevet est demandé sur la base de l'invention intitulée :

As a below-named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name. I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled :

**UNIVERSAL GROUND ANCHOR SUPPORT FOR MINE SHAFT**

dont la description :

☐ est annexée aux présentes;

☐ a été déposée :

- Demande de brevet No. :
- Date de dépôt :

dont la description :

☒ is attached hereto;

☐ was filed:

- Patent application No.:
- Filing date:

Je déclare par les présentes avoir examiné et compris le contenu de la description identifiée ci-dessus, revendications y compris, et le cas échéant telle que modifiée par un amendement. Je reconnais le devoir de divulguer toute information qui soit en rapport avec l'examen de cette demande selon le titre 37 de la Codification des Règlements Fédéraux § 1.56(a). Je revendique par les présentes le bénéfice de priorité étrangère selon le titre 35 de la codification des États-Unis, § 119 de toute demande de brevet ou tout certificat d'auteur énuméré ci-après, et j'ai identifié également ci-après toute demande étrangère de brevet ou de certificat d'auteur ayant une date de dépôt antérieure à celle de la demande pour laquelle la priorité est revendiquée.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a). I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

*Demande(s) antérieure(s) dans un autre pays / Prior foreign applications:*

- Pays / Country:
- Demande N° / Serial N°:
- Date de depot / Filing date:
- Revendication de priorité / Priority claimed:

Je reconnais le devoir de divulguer l'information pertinente selon le titre 37 de la codification des règlements fédéraux, § 1.56(a), sur toute information qui se présente entre la date de dépôt de la demande antérieure et la date de dépôt de cette demande, soit nationale, soit internationale PCT. Je déclare par les présentes que toutes mes déclarations, à ma connaissance, sont vraies et que toutes les déclarations faites à partir de

I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56 (a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made

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## POUVOIR

En tant qu'inventeur, je désigne les agents de brevets suivants pour poursuivre la procédure de cette demande et traiter toute affaire la concernant par devant le bureau des brevets et marques:

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Je nomme également comme représentant pour signification aux fins de recevoir tout avis affectant le brevet ou les droits en découlant :

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États-Unis d'Amérique

Nom complet du seul ou premier inventeur:

Signature de l'inventeur :

Date : \_\_\_\_\_

Domicile :

Citoyenneté :

Adresse postale :

## POWER OF ATTORNEY

As a named inventor, I hereby appoint the following patent agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

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I further appoint as domestic representative to whom may be served process or notice of proceedings affecting the patent or rights thereunder:

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USA

Full name of the sole or first inventor:

**Marcellin Bruneau**

Inventor's signature:

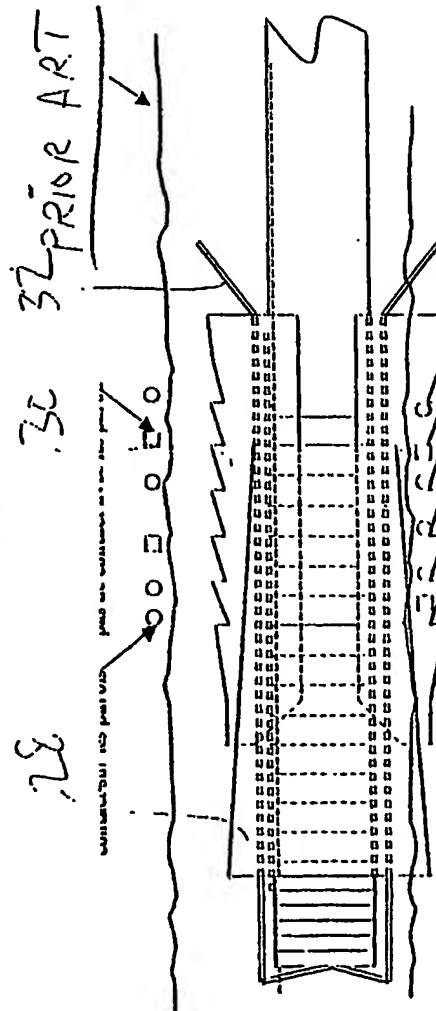
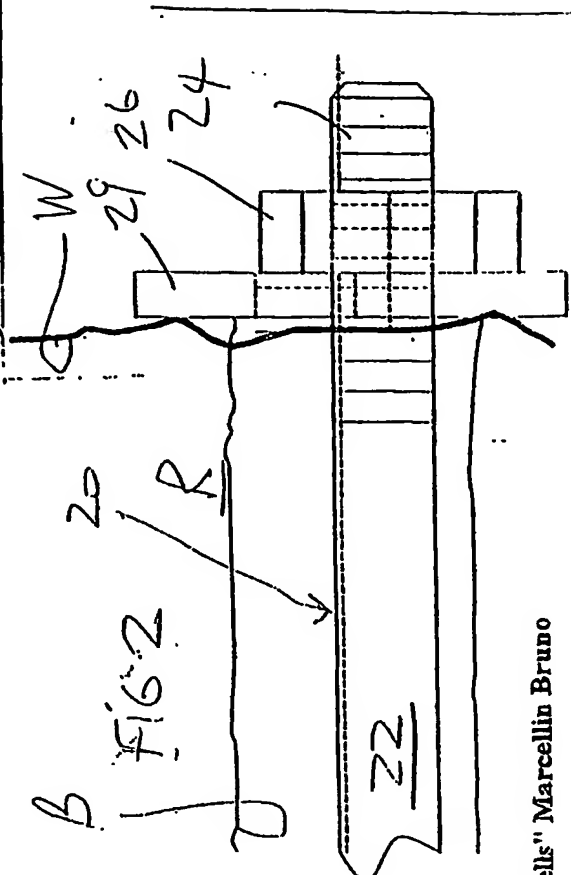
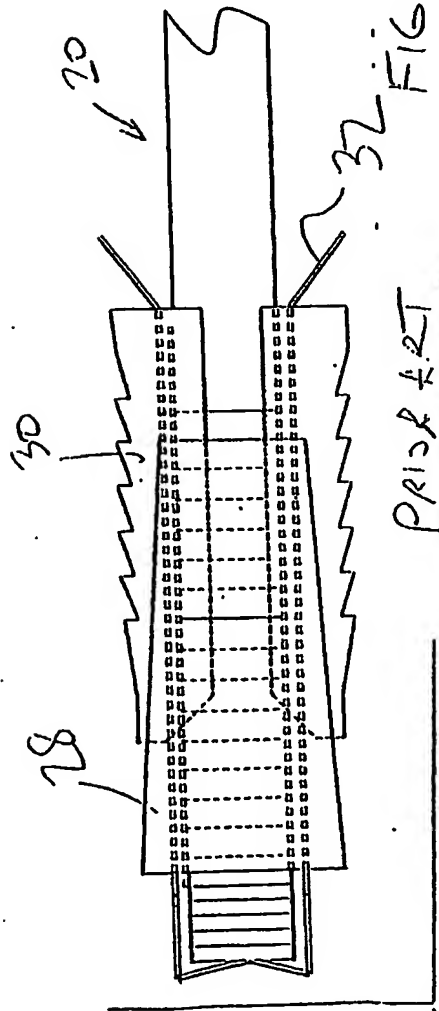
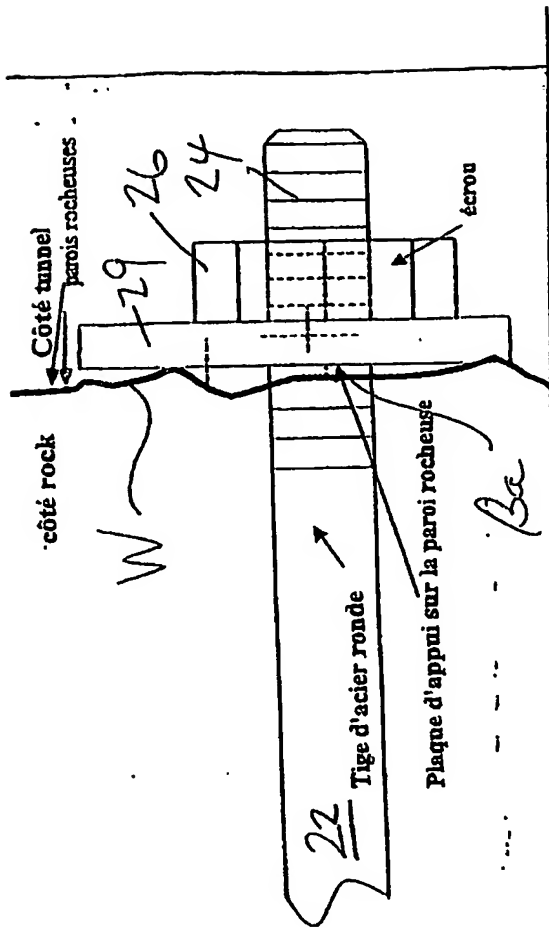
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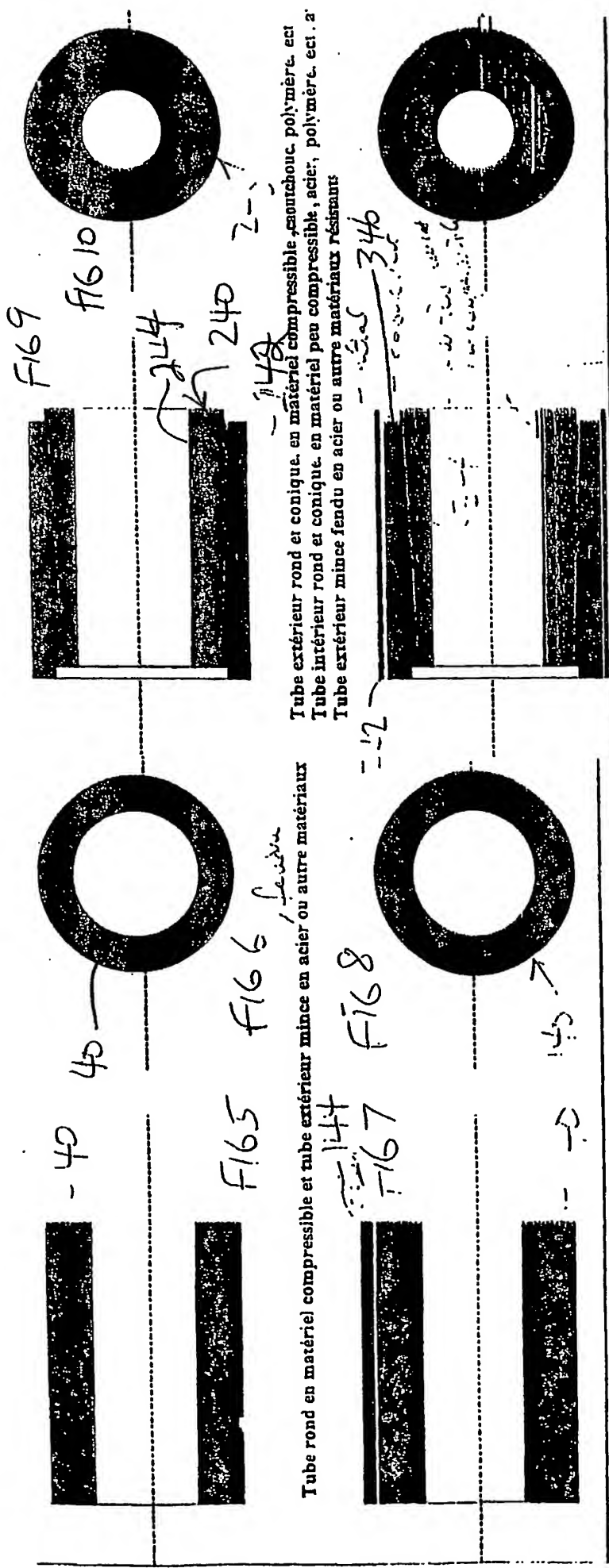
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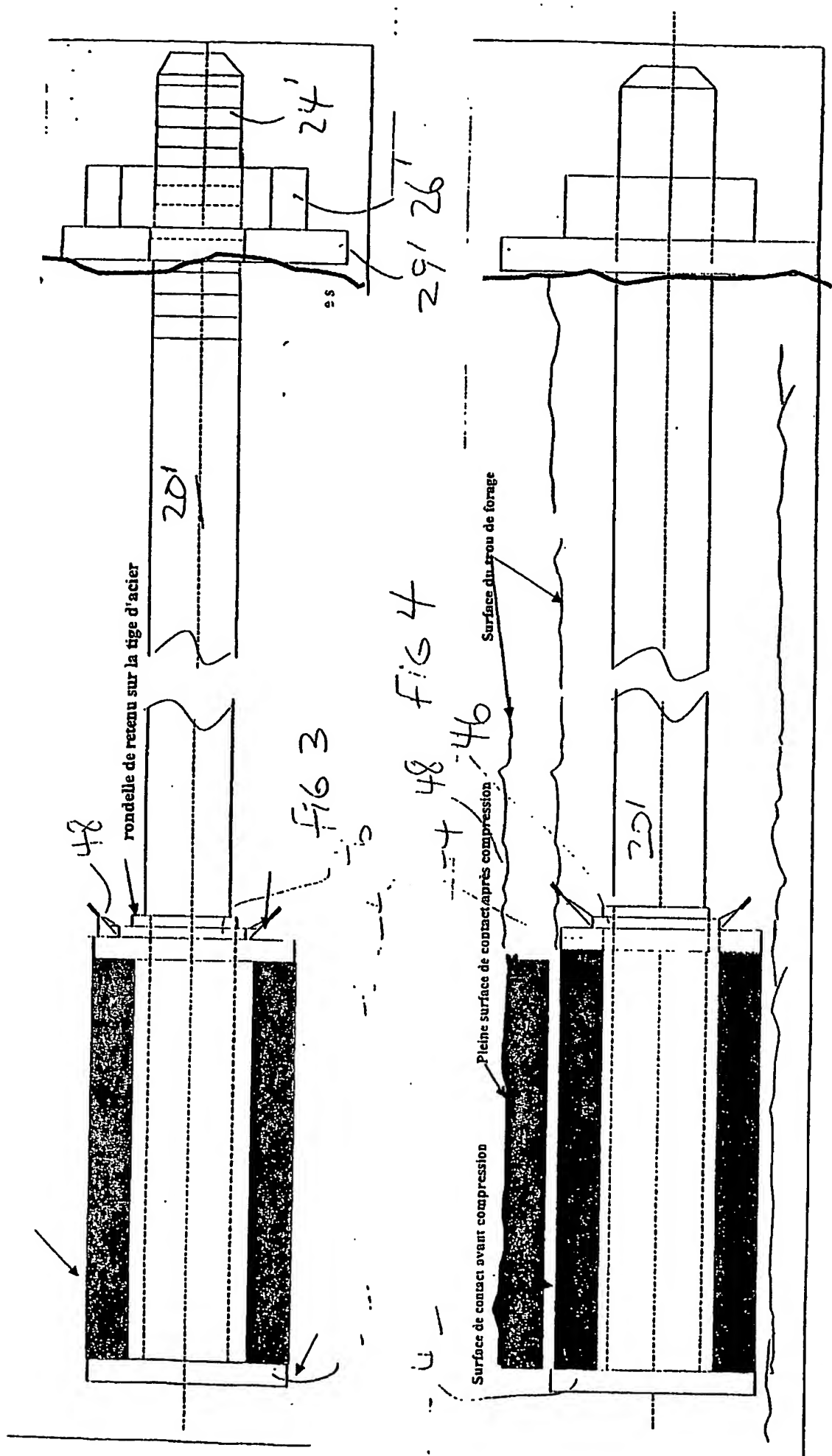
Coquilles d'expansions "Expansion shells" Marcellin Bruno

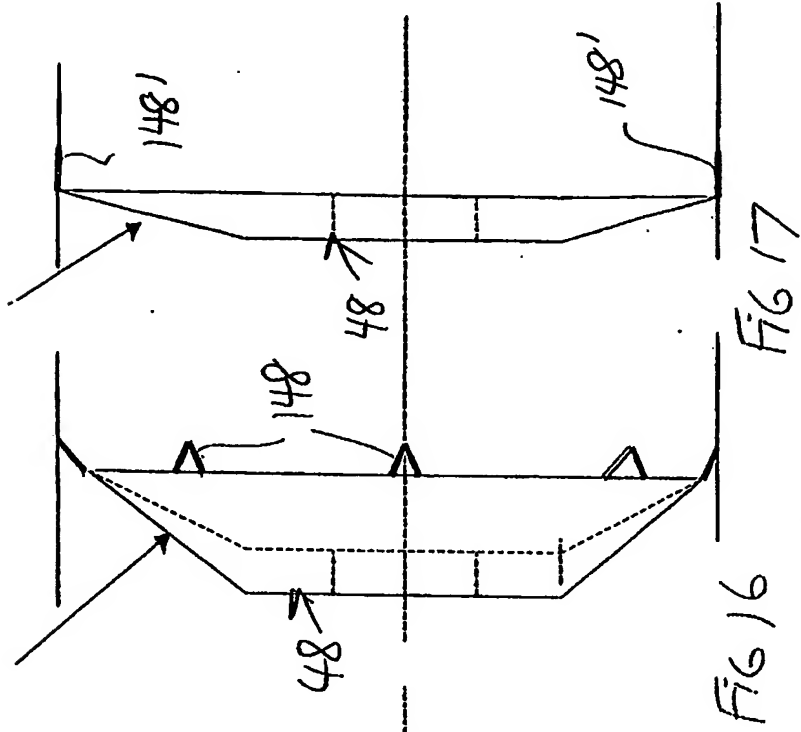
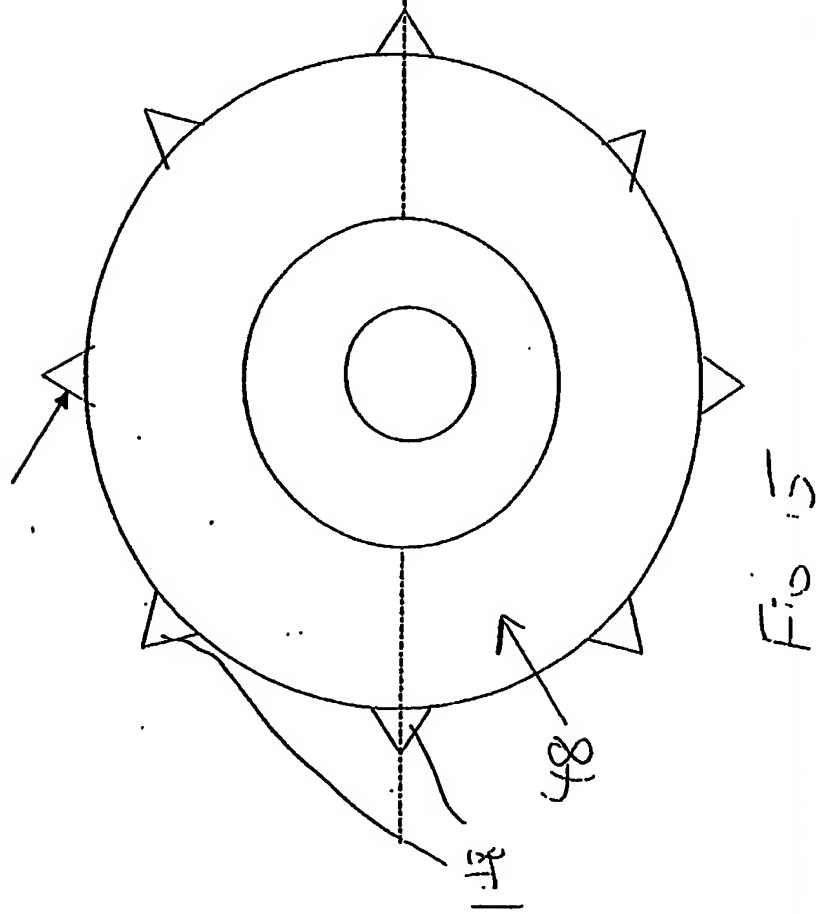


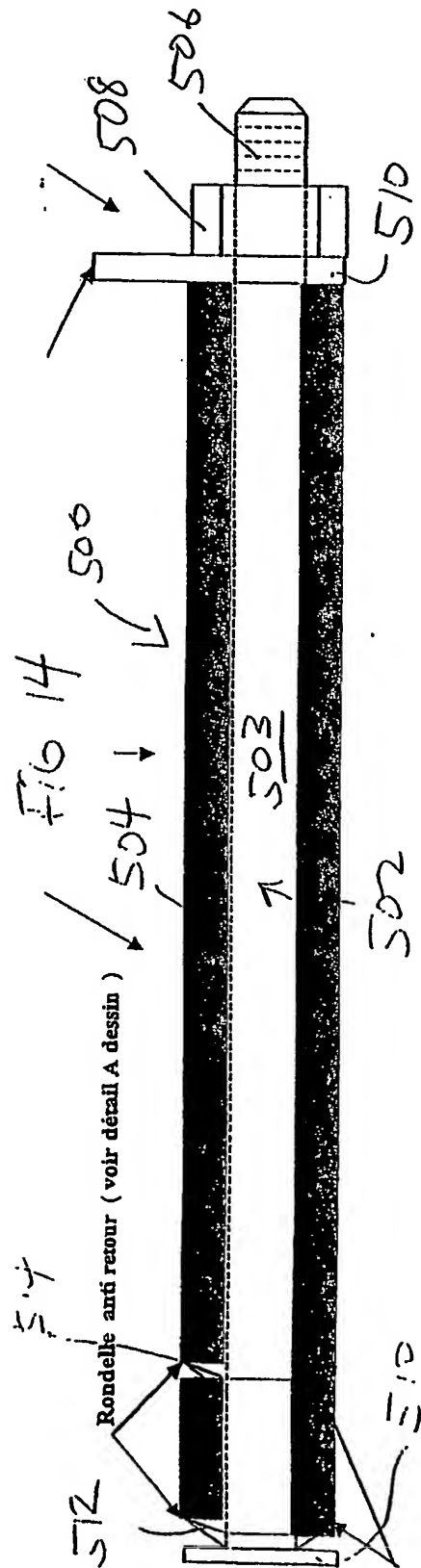
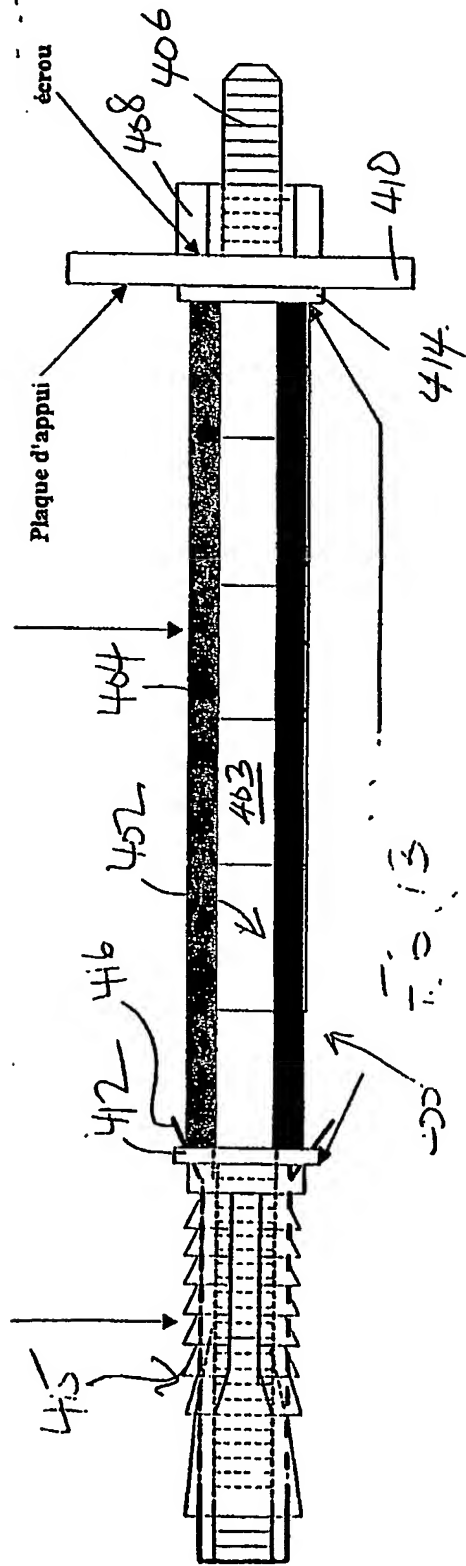
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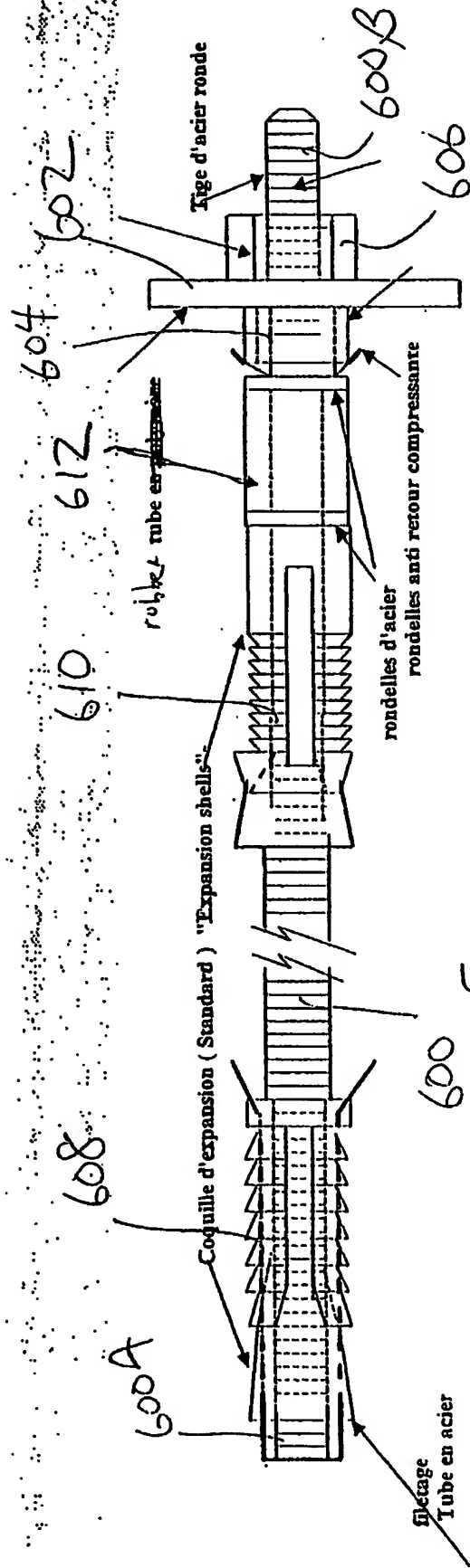


Fig 18

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